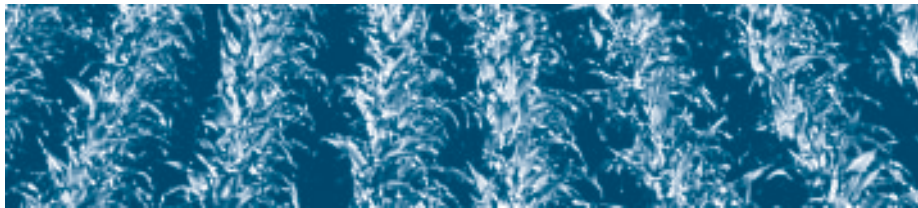


Iowa's Renewable Energy Resources



Renewable energy holds enormous economic and environmental opportunities for the state of Iowa. From wind, to ethanol, to switchgrass, Iowa's portfolio of natural resources — combined with its agricultural expertise — make the state an ideal leader in the development of “homegrown” energy.

The reasons for Iowa's establishment of a renewable energy industry are numerous. Doing so creates a diversified portfolio of energy resources to meet the state's needs. It creates a healthier environment by improving air, water and soil quality. Economically, renewable energy development can keep dollars in the state while increasing national security. Also, renewable energy can mean a new revenue stream for Iowa's businesses and farms.

Many homegrown energy resources are agriculturally produced, representing tremendous new markets for Iowa's farm sector. Iowa is the national leader in corn, soybeans and hog production, while also being a top-ten producer of oats, alfalfa, and cattle.¹ The state's farmers have the expertise and knowledge to create new markets for value-added agricultural products — especially renewable energy.

Many researchers, private indus-



tries, state agencies and universities in Iowa are working to develop a “BioEconomy” for the state, in which bio-based, renewable materials are used and marketed as resources for products, materials, fuel and energy. Developing a bio-based industry can give a major boost to the economy.

As an example of the economic potential available from renewables, ethanol currently affects 13,250 jobs in Iowa, including 2,550 jobs directly related to ethanol production. Additionally, Iowa's annual economic activity generated from ethanol production is \$1.7 billion.² Seven new, farmer-owned ethanol plants are under construction or have been completed since 2001. These seven plants will process more than 70 million bushels of corn into almost 200 million gallons of ethanol each

year. They also will create 173 new jobs while providing profits to 3,400 farmer members.

Economic benefits are magnified by Iowa's diverse natural resources. The state's fertile soil is able to support diverse energy crops. Another area with energy potential is methane, a by-product from livestock, landfill and wastewater facilities. And as the tenth windiest state in the nation, nearly 40 percent of Iowa's land area is capable of generating electricity from wind.³

In addition to economic returns, Iowa's environment has much to gain from renewable energy development. Wind, hydropower and solar energy are virtually “clean” resources, meaning no air emissions are released into the environment when they are converted to electricity, heat or other forms of energy. Switchgrass, ethanol and biodiesel are considered “net zero” sources of carbon dioxide — during the growing process of the plants that serve as fuel feedstocks, as much carbon dioxide is absorbed as is later emitted when they serve as energy sources. Also, methane energy recovery avoids emissions that would otherwise be released into the air.

DEFINITION

Renewable energy consists of resources that can be naturally replenished, such as wind, solar, biomass and water. The energy from these resources can be converted into electricity, heat or transportation fuel.

Iowa's water and soil also benefit from renewable energy development. Energy crops, such as poplar trees and switchgrass, can protect water quality by decreasing soil erosion and lessening chemical applications, compared to other cash crops. Water quality also is improved when renewable energy replaces nuclear power. Nuclear power plants may cause thermal pollution to water streams when the water is used in cooling towers, and increased water temperatures may affect aquatic life. Nuclear power is also a concern for safety and disposal reasons.

Iowa's Energy Picture

To understand the relevance of homegrown energy to Iowa, the first step is to assess overall energy consumption. Iowa's total energy expenditures were \$6.6 billion in 1999.⁴ Iowa produces about 3 percent of the energy it consumes, primarily from hydropower, biomass and ethanol. The remainder is imported from other states and nations.

Currently, 94 percent of the energy consumed in Iowa comes from fossil fuels.⁵ Coal and petroleum are the state's most frequently used fuels, each constituting 37 percent of total energy consumption. Natural gas is 20 percent of the total followed by "Other" at 6 percent, which includes nuclear and renewable energy.⁶

Fossil fuels contribute more than one hundred million tons of emissions to Iowa's air each year. The breakdown of air emissions for 1999 from coal, natural gas and transportation fuel consumption is:⁷

- ♦ Carbon dioxide - 107,500,000 tons
- ♦ Nitrous oxides - 80,500 tons
- ♦ Sulfur oxides - 144,000 tons
- ♦ Particulates - 19,500 tons

Current Renewable Energy Portfolio

The chart at right shows Iowa's total use of renewable energy resources, including those used for electricity, transportation, heating, etc. (converted to kilowatt hours).⁸ These

resources are showcased in this *Renewable Energy Resource Guide* according to the following categories:

- ♦ Wind Energy
- ♦ Hydropower
- ♦ Solar
- ♦ Renewable Transportation Fuels
- ♦ Methane Energy Recovery
- ♦ Switchgrass and Energy Crops
- ♦ Biomass-Other (waste, wood waste and soy-based lubricants)

On a global level, renewable energy is the world's fastest growing energy source (see bottom chart on page nine). World experts from the energy industry are projecting that as renewable energy becomes commercially accepted, prices for these resources are likely to go down. The top chart on page nine, created by the International Energy Industry and published by the World Resources Institute, demonstrates the trends and projections for international renewable energy development, especially as they relate to prices.⁹

The resources with the greatest growth potential in Iowa are those that build from the state's ecological and economic environments. For these reasons, biomass and wind have experienced the greatest growth rates in recent years.

State of Iowa Renewable Energy Statutes

The state's dedication to homegrown energy is founded in several statutory measures promoting its development and use. A cornerstone is Code of Iowa Chapter 473, Section

3, which states:

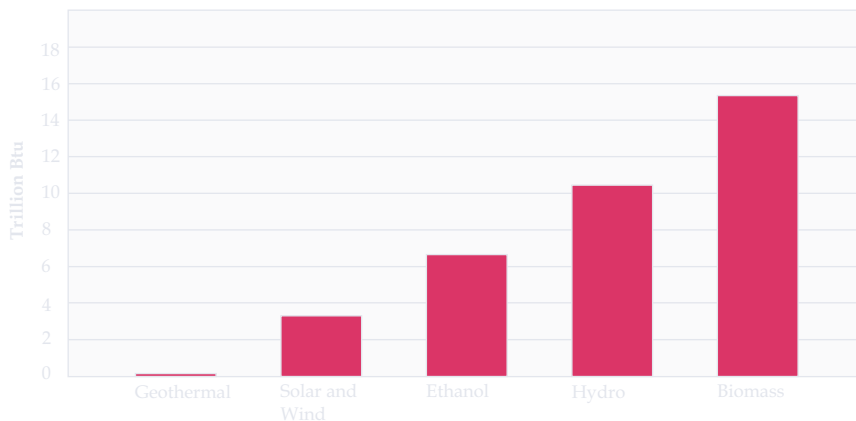
*The goal of this state is to **more efficiently utilize energy resources**, especially those that are nonrenewable or that have negative environmental impacts, in order to enhance the economy of the state and to decrease the state's dependence on energy resources from outside the state by reducing the amount of energy used.*

*This goal is to be implemented through ... the development of **indigenous energy resources that are economically viable**....*

Other state policies assisting renewable energy development include:

- ♦ The alternate energy purchase program, which requires all electric utilities within the state to offer customers the opportunity to purchase power generated from alternate energy production facilities by January 1, 2004. (Code of Iowa 476.47)
- ♦ A \$0.025 sales tax credit for retail fuel stations. Stations that have ethanol-blended gasoline as more than 60 percent of their total gasoline sales can take advantage of the tax credit for those ethanol gallons sold above the 60 percent level. (Code of Iowa 422.11C)
- ♦ The Alternative Energy Production Law, requiring the state's investor-owned utilities to purchase 105 megawatts of electricity produced from renewable resources. (Code of Iowa 476.44.2)
- ♦ Establishment and funding of the Center for Global and Regional

1999 Iowa Renewable Energy Consumption



Note: graph is for all energy uses including electricity, heat, transportation, etc.

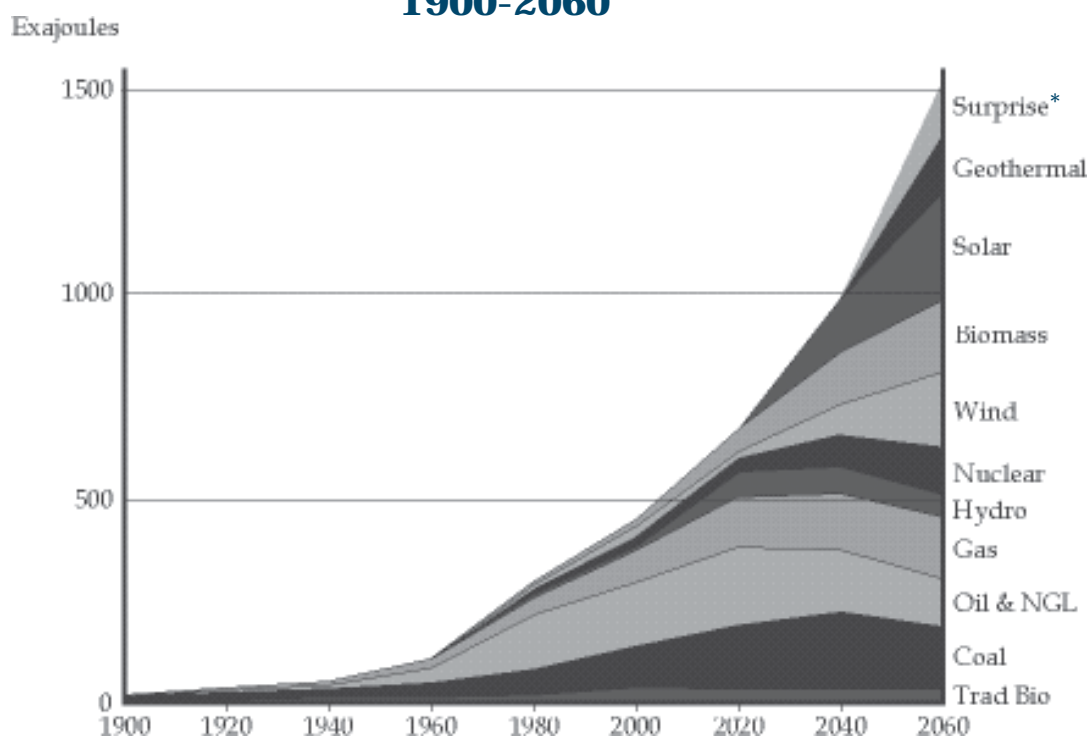
Costs of Delivered Energy, Current Capital Costs & Anticipated Cost Reduction for Selected Renewables

Technology	Cost of Delivered Energy	Current Capital Cost (Typical)	Trend in Capital Cost, Past 10 Years	Expected Trend in Capital Cost, Next 10 Years
Wind	0.04 to 0.10 \$/kWh	800 to 3,500 \$/kW installed	-30 to -50%	-20 to -35%
Solar Photovoltaics	0.25 to 1.50 \$/kWh	8,000 to 35,000 \$/kW installed	-40%	-40 to -50%
Biomass Wood and biomass crops (combustion or other conversion)	0.05 to 0.08 \$/kWh	2,500 to 3,500 \$/kW	-10 to -15% (electricity production) -5 to -10 % (heat)	-30 to -50% -5%
Landfill gas from wastes	0.04 to 0.06 \$/kWh	630 to 1,170 \$/kW	-10 to 15%	Slight increase
Anaerobic digestion of wastes	0.02 to 0.14 \$/kWh	250 to 450 US\$/ton capacity	-5 to -10%	-5 to -10%
Combustion of solid wastes	0.02 to 0.14 \$/kWh	7,800 to 10,000 \$/kW	Constant, now rising	Continuing to rise
Biofuels: ethanol	0.24 to 0.37 \$/litre	0.06 to 0.13 \$/litre	-5 to -10%	-25 to -50%
Biofuels: biodiesel	0.40 to 0.52 \$/litre	0.07 to 0.10 \$/litre	-5 to -10%	-20 to -25%

Source: International Energy Agency, *Key Issues in Developing Renewables* (Paris: OECD/IEA, 1997).

Source: *Building a Safe Climate*, Sound Business Future © 1998. World Resource Institute p. 19.

Scenario of World Energy Resources 1900-2060



Source: Shell International Petroleum Company, 1999.

*Surprise = those resources not yet discovered or invented.





Environmental Research and the Iowa Energy Center. (Code of Iowa 476.10A)

- ♦ Net metering, which allows a renewable energy producer to get credit for any excess electricity produced. (Iowa Administrative Code 199-15.11)
- ♦ Creation of the Iowa Energy Bank, which provides low-cost financing to taxpayer-supported facilities interested in using renewable energy resources for electricity and heat production, and to make energy-efficiency improvements. (Code of Iowa 473.19)
- ♦ Establishment of the Alternative Energy Revolving Loan Program, providing low-cost financing to organizations and individuals interested in creating alternative-energy production facilities. (Code of Iowa 476.46)
- ♦ The Iowa ethanol excise tax exemption, providing a one-cent decrease on the retail price of ethanol-blended fuel. (Code of Iowa 452A.3)
- ♦ A sales tax exemption from the sale of property used to convert wind energy to electrical energy. (Iowa Administrative Code, 701-18.56(422,423))
- ♦ Property tax exemptions or reductions for methane, solar and wind energy property (Code of Iowa 427.1, 441.21, 427B.26)
- ♦ Replacement generation tax exemptions, which exempt electricity generated by wind or methane conversion property from the replacement generation tax. (Code of Iowa 437A.6)

In 2002, the United States Congress passed the Farm Security and Rural Investment Act, which provides more than \$400 million for renewable energy development. The legislation offers significant opportunities for Iowa to demonstrate and commercially expand renewable resources.

Another national policy trend is a renewed focus on national security and energy independence. The federal government is looking at opportunities to decrease the country's reliance on imported fossil fuels; renewable energy development is a critical strategy for achieving that goal.

Iowa legislation passed in 2002 requires all utilities to offer "green power" options to their customers. Under green power programs, consumers can voluntarily choose to pay slightly higher prices for energy produced from renewable sources. Nationally, green power programs have been well received, with customers seeking electricity generated from renewable energy.

Many states have enacted policies to assist in the development of a renewable energy industry (see chart, page 11). Tax incentives are one alternative for stimulating expansion, and can include production tax credits, investment tax credits, sales tax reductions and property tax reductions. Another option is to develop production incentives, encouraging producers to expand their renewable energy resources by providing additional payments above the market price. For example, in some states, ethanol production receives a \$.20 per gallon incentive. Several states are also evaluating the potential of a renewable portfolio standard, requiring a certain percentage of electricity production to originate from renewable energy resources.

Technological advancements could also boost renewable energy use. One example is the fuel cell. Fuel cells replace traditional power sources in cars or buildings, such as engines and furnaces. Because they generate power from a chemical reaction instead of combustion (much like a battery), virtually no pollutants are emitted. The U.S. Department of Energy projects that if 10 percent of automobiles nationwide were powered by fuel cells, it would cut oil imports by 800,000 barrels a day.

the Purpose of This Guide

Many agencies and organizations have taken the lead in developing renewable energy in Iowa. The goal of this guide is to present a comprehensive overview of what is being accomplished. The guide also provides in-depth descriptions of the state's more significant renewable energy resources, along with their past growth, current status and future opportunities in Iowa.

References

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2. *Ethanol Facts*. Iowa Corn Promotion Board. May 1998.
3. *Wind Energy Resource Information Sheet - Iowa*. Pacific Northwest Laboratory. September 1990.
4. *2002 Iowa Comprehensive Energy Plan Update*. Iowa Department of Natural Resources.
5. *ibid.*
6. *Addendum to the 2002 Iowa Comprehensive Energy Plan*. Iowa Department of Natural Resources.
7. *2002 Iowa Comprehensive Energy Plan Update*. Iowa Department of Natural Resources.
8. Iowa Department of Natural Resources.
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Looking Toward the Future

Many state and national policy trends are impacting the growth and attractiveness of the renewable energy industry.

Funding Mechanisms for Renewable Energy Policies

Renewable Energy Policy Options	State government general fund	State bonds	Earmarked taxes	Electric service wire charge	Voluntary consumer payments	Blended price of service
Tax Incentives						
Production Tax Credits	✖		✖			
Investment Tax Credits	✖		✖			
Sales Tax Reductions	✖ (or local)					
Property Tax Reductions	✖ (or local)					
Accelerated Depreciation	✖					
Direct Cash Payments						
Direct Production Incentives			✖	✖		
Direct Investment Incentives (Grants)	✖	✖	✖	✖		
Low-Cost Capital Programs						
Government-Subsidized Loans	✖	✖	✖	✖		
Project Loan Guarantees	✖	✖	✖	✖		
Project Aggregation	✖		✖	✖		
Customer Choice Opportunities						
Utility Supplied Green Pricing Options					✖	✖
Green Marketing					✖	
Aggregated Consumer Purchases					✖	
Certification and Disclosure Programs	✖				✖	✖
General Environmental Regulations						
Externality Valuation						✖
Environmental Dispatch						✖
Emissions Taxes						✖
Emissions Caps						✖
Other Policy Options						
Standard Contracts for Small Projects			✖	✖		✖
Net Metering				✖		✖
Line Extension Policies					✖	✖
Site Prospecting, Review and Permitting	✖			✖		
Renewables Portfolio Standard						✖
Auctioned Contracts			✖	✖		✖
Government Purchases	✖	✖				
Performance-Based Ratemaking						✖

Checks are given if funding source is particularly appropriate. Other funding sources may be possible, but seem less appropriate or less likely.

Source: National Wind Coordinating Committee. Draft Policy Paper. January 1997.

